

The Power, Product and Quotient Rules

Quotient Rule: If f and g are both differentiable, then

$$\frac{d}{dx} \left[\frac{f(x)}{g(x)} \right] = \frac{g(x) \frac{d}{dx} f(x) - f(x) \frac{d}{dx} g(x)}{[g(x)]^2}$$

Differentiate $y = \frac{t \cdot f(t)}{g(t)}$

$$\begin{aligned} y' &= \frac{g(t) \frac{d}{dt} f(t) - f(t) \frac{d}{dt} g(t)}{(g(t))^2} \\ &= \frac{(t^2 - 2t + 1) \frac{d}{dt} (t) - (t) \frac{d}{dt} (t^2 - 2t + 1)}{(t^2 - 2t + 1)^2} \\ &= \frac{(t^2 - 2t + 1)(1) - (t)(2t - 2)}{(t^2 - 2t + 1)^2} \\ &= \frac{t^2 - 2t + 1 - 2t^2 + 2t}{(t^2 - 2t + 1)^2} \\ &= \frac{-t^2 + 1}{(t^2 - 2t + 1)^2} \end{aligned}$$